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INTERNATIONAL PRELIMINARY EXAMINATION REPORT 16 FEB 2004

(PCT Article 36 and Rule 70)

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Applicant's or agent's file reference 699759	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416).	
International Application No. PCT/AU2003/000955	International Filing Date (day/month/year) 29 July 2003	Priority Date (day/month/year) 31 July 2002
International Patent Classification (IPC) or national classification and IPC Int. Cl. ⁷ H01J 49/26		
Applicant VARIAN AUSTRALIA PTY LTD et al		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 3 sheets, including this cover sheet.

☒ This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 2 sheet(s).

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☐ Certain observations on the international application

Date of submission of the demand 27 October 2003	Date of completion of the report 6 February 2004
Name and mailing address of the IPEA/AU AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA E-mail address: pct@ipaaustralia.gov.au Facsimile No. (02) 6285 3929	Authorized Officer IRINA TALANINA Telephone No. (02) 6283 2203

I. Basis of the report**1. With regard to the elements of the international application:***

- ☐ the international application as originally filed.
- ☒ the description, pages 1, 2, 4-20, as originally filed,
pages , filed with the demand,
pages 3, received on 23 January 2004 with the letter of 23 January 2004
- ☒ the claims, pages 22-25, as originally filed,
pages , as amended (together with any statement) under Article 19,
pages , filed with the demand,
pages 21, received on 23 January 2004 with the letter of 23 January 2004
- ☒ the drawings, pages 1/7 - 7/7, as originally filed,
pages , filed with the demand,
pages , received on with the letter of
- ☐ the sequence listing part of the description:
pages , as originally filed
pages , filed with the demand
pages , received on with the letter of

2. With regard to the language, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language which is:

- ☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of the translation furnished for the purposes of international preliminary examination (under Rules 55.2 and/or 55.3).

3. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

4. ☐ The amendments have resulted in the cancellation of:

- ☐ the description, pages
- ☐ the claims, Nos.
- ☐ the drawings, sheets/fig.

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).**

* Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17).

** Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.
PCT/AU2003/000955

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims 1-23	YES
	Claims	NO
Inventive step (IS)	Claims 1-23	YES
	Claims	NO
Industrial applicability (IA)	Claims 1-23	YES
	Claims	NO

2. Citations and explanations (Rule 70.7)

Claims 1-23 meet the criteria set out in PCT Article 33(2)-(4) because the prior art does not teach or fairly suggest a mass spectrometer including an interface between a plasma ion source and a mass analyser wherein a reactive gas for attenuating polyatomic or multicharged interfering ions by promoting reactive or collisional interactions in plasma is supplied into an aperture of a sampling cone or a skimmer cone of the interface through which the plasma flows from a higher pressure region toward a lower pressure region. In the prior art mass spectrometers, the reactive gas has been supplied in the region between the sampling and skimmer cones.

The invention has industrial applicability in mass spectrometry.

Disclosure of the Invention

According to a first aspect, the present invention provides a mass spectrometer including

- 5 a plasma ion source for providing analyte ions,
a mass analyser,
an interface between the plasma ion source and the mass analyser,
the interface comprising a structure being one of a sampling cone
and a skimmer cone of the interface which separates a first region at a relatively
high pressure which receives plasma from the plasma ion source from a second
10 region at a relatively low pressure leading to the mass analyser and which
provides an aperture between the first higher pressure region and the second
lower pressure region through which the plasma flows from the higher pressure
region towards the lower pressure region,
the interface structure including a passage for supplying a
15 substance into the aperture for interaction with the plasma for attenuating
polyatomic or multicharged interfering ions by reactive or collisional interactions.

The invention, in a second aspect, provides a method for plasma mass spectrometry including

- 20 generating a plasma containing analyte ions,
substantially confining the plasma radially whilst flowing it from a higher
pressure region towards a lower pressure region,
supplying a substance directly into the substantially radially confined
plasma to cause reactive or collisional interactions with polyatomic or
25 multicharged interfering ions therein and thereby attenuate such polyatomic or
multicharged ions, and
extracting an ion beam from the plasma for mass analysis of the analyte
ions.

- 30 In the case of an ICP-MS having a sampling cone-skimmer cone
interface, the aperture of a mass spectrometer according to the first aspect of
the invention may be the hole through either the sampling cone or the skimmer
cone. Such a hole will radially confine the plasma as defined in the second

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A mass spectrometer including
a plasma ion source for providing analyte ions,
a mass analyser,
5 an interface between the plasma ion source and the mass analyser,
the interface comprising a structure being one of a sampling cone and a
skimmer cone of the interface which separates a first region at a relatively high
pressure which receives plasma from the plasma ion source from a second
region at a relatively low pressure leading to the mass analyser and which
10 provides an aperture between the first higher pressure region and the second
lower pressure region through which the plasma flows from the higher pressure
region towards the lower pressure region,
the interface structure including a passage for supplying a substance into
the aperture for interaction with the plasma for attenuating polyatomic or
15 multicharged interfering ions by reactive or collisional interactions.
2. A mass spectrometer as claimed in claim 1 wherein the interface
comprises a sampling cone followed by a skimmer cone, wherein said structure
is the skimmer cone which includes the passage for supplying a substance into
20 its aperture.
3. A mass spectrometer as claimed in claim 1 wherein the interface
comprises a sampling cone followed by a skimmer cone, wherein said structure
is the sampling cone which includes the passage for supplying a substance into
25 its aperture.
4. A mass spectrometer as claimed in claim 2 wherein the sampling cone
includes a passage for supplying a substance into its aperture for interaction
with the plasma for attenuating polyatomic or multicharged interfering ions by
30 reactive or collisional interactions.
5. A mass spectrometer as claimed in any one of claims 2 to 4 including
electrode means following the skimmer cone for extracting an ion beam
containing analyte ions from the plasma for transmission to the mass analyser,